

REAR PROJECTION DISPLAY DEVICE
AND PROJECTING METHOD USED FOR THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a rear projection television or rear projection display device and a projecting method thereof and, particularly, to a rear projection display device for enlarging and projecting an image on an image display element onto a projection screen.

2. Description of the Prior Art

Conventional rear projection display devices will be described with reference to FIG. 1 to FIG. 3. FIG. 1 is a cross section of a conventional rear projection television, showing its inner construction. As shown in FIG. 1, a light beam emitted from a projector 101 provided on a rear portion of a bottom plate of a casing of the rear projection television is reflected by a first flat mirror 102 provided in a lower front portion of the casing and, then, a second flat mirror 103 provided on a rear wall of the casing, and, finally, focused on a projection screen 104 provided in a front plate of the casing.

FIG. 2 is a partially cross-sectioned perspective view showing an inner construction of another conventional rear projection display device. As shown in FIG. 2, a light beam emitted from a projector 101 provided on an upper plate of a casing of the conventional device is reflected down by a first flat mirror 102, reflected rearward by a second flat

mirror 103 and, then, reflected forward by a third flat mirror 109 onto a projection screen 104 provided in a front plate of the casing. In FIG. 2, thickness, that is, depth size, of the device is reduced by increasing the number of reflections of the light beam projected from the projector 101. A rear projection display device of the above-stated type is disclosed in, for example, JP H4-107521A.

FIG. 3 illustrates a generation of stray light in a conventional rear projection display device such as shown in FIG. 2. In FIG. 3, a light beam, which is emitted from a projector 101 and reflected onto a projection screen 104 by flat mirrors 102 and 103, is partially reflected by a surface of the projection screen 104 at a time when the light beam is incident obliquely on the projection screen. The light portion 111 reflected by the projection screen 104 is reflected by the flat mirrors 103 and incident again on the projection screen 104 as a light beam 112. The light beam 112 appears on the screen as a stray light, causing a ghost image on the screen.

Similarly, an external light beam such as light from a room illumination lamp entered into the casing may generate stray light with which a ghost image may also appear on the screen.

In such conventional rear projection display device as mentioned above, there are many problems.

A first one of them is that a space for receiving one of the flat mirrors must be provided in a portion of the

casing of the rear projection television below the screen thereof. Such space may form a skirt portion, which is undesirable in appearance of the rear projection display device and is an obstacle to reduction of the size of the rear projection display device.

A second problem is that the length of the conventional rear projection television in depth becomes large due to long projection light path of the rear projection television. That is, in the conventional projection using projection lenses, the projection path length tends to become large due to the design of the lens. Even if the light path is shortened by folding the light path by using a plurality of reflection mirrors, the size of the rear projection television in depth becomes similar to that of a CRT monitor at best.

A third problem is that stray light, which is a cause of ghost image on the screen, is generated by reflection of a light beam at an incident surface of the screen and/or external light entering into the rear projection television.

A fourth problem is that, when a large number of reflection mirrors are used, the luminance of an image on the screen is degraded due to reflectivity problems of the respective reflection mirrors.

A fifth problem is that, due to the presence of the skirt portion of the conventional rear projection television, it is impossible to manufacture a multi rear projection television including a plurality of rear